VCPRP SCOPES OF WORK FOR INVESTIGATION

Introduction

KDHE determines the class of contamination at a property based on information contained in the VCPRP Application to Participate and in supporting documents (for details, see Section 1.4). Designation of Class I Contamination at a property generally means that KDHE has preliminarily determined that suspected or confirmed contamination exists at the property and the property does not appear to be a source for the contamination. In some cases, a property with Class I Contamination may be located adjacent to a property with a known source for the contamination. Alternately, a property may have confirmed contamination for which the source location is unknown and the nature of the contamination may not be consistent with the known or assumed current and historical use of the property.

Class II Contamination at a property is generally defined as suspected or confirmed soil contamination on the property and there is no known or suspected ground water contamination. Class III Contamination at a property is generally defined as suspected or confirmed soil and ground water contamination on the property and the contamination is contained within the boundaries of the property. Class IV contamination at a property is generally defined as suspected or confirmed soil and ground water contamination on the property and beyond the property boundaries (i.e., off-site migration).

Voluntary Cleanup Investigation Work Plan

If KDHE determines that existing environmental investigations do not adequately characterize contamination at a property, a Voluntary Cleanup Investigation (VCI) may be required. Performance of a VCI will involve three processes: 1) development of a VCI Work Plan; 2) implementation of the KDHE-approved VCI Work Plan; and 3) reporting the investigative results in a VCI Report. A VCI Work Plan describing the proposed investigative activities at a property must be prepared and submitted to KDHE for approval prior to beginning the investigation. The VCI Work Plan must include a detailed schedule of activities which specifically identifies the dates and time frames for performing and completing the VCI. Refer to the recommended VCI Work Plan and VCI Report content and format guidance provided in this section following discussion of the VCI Scopes of Work.

Suggested Scopes of Work for a VCI are given below for each class of contamination. If KDHE determines that a VCI will be required at a property, an appropriate choice from these Scopes of Work may be used to tailor a VCI Work Plan suitable to adequately characterize contamination at the property.

Class I Contamination

Considering the primary objective of obtaining KDHE's determination for "No Further Action" at a property, actions to address Class I Contamination properties may vary considerably. Required actions may range from the Voluntary Party conducting investigative activities, as necessary, to verify that the property falls into the Class I Contamination category, to KDHE simply reviewing existing file information on an adjacent property with a known source. The general objectives for a property with Class I contamination include:

1) Identify the contaminants suspected or confirmed at the property and the media impacted;

2) Determine the potential for the subject property to be a source for the contaminants identified. This could include identification of known sources on adjacent properties, documentation of historical activities conducted at the subject property, documentation of chemical products and compounds used, handled, stored, etc., at the subject property; and

3) Conduct investigations as necessary to verify whether a source for contamination is present on the property. As previously stated, an investigation may or may not be necessary; the necessity for a Voluntary Cleanup Investigation will be determined on a case by case basis.

Because of the potential variability in the nature of work that may be required for Class I Contamination properties, KDHE can not provide a standardized task-specific scope of work. The important fact to note is an investigation may be required to verify that a property is indeed appropriately determined to be a Class I Contamination property. If an investigation is required, the scope and tasks for the investigation will be determined jointly by the Voluntary Party and KDHE, and the final scope for the investigation will be very specific to determining whether a Class I Contamination designation is appropriate for the property. A work plan, investigative report, quality assurance/quality control requirements, verification sampling, and notification requirements as required for Voluntary Cleanup Investigations will also be necessary for any investigations conducted to verify that the Class I Contamination designation is appropriate.

No Further Action Determinations for Class I Contamination Properties

In accordance with K.S.A. 65-34, 169 (b)(1), KDHE may consider issuing a "No Further Action" determination for a property that is impacted by contamination, but has been confirmed not to be the source for the contamination, provided that the necessary action to protect public health and environment is or will be taken by a financially capable person or entity, even if not responsible for the contamination. This means KDHE can only issue "No Further Action" determinations for verified Class I Contamination properties when the source for the contamination is being addressed under an agreement or order executed between KDHE (or EPA) and a person or entity taking action to address the source.

In summary, KDHE's listing of general requirements for a Class I Contamination property to obtain a "No Further Action" determination includes:

1) The owner or operator, or both, of the subject property shall submit a completed application to KDHE, including environmental assessments and investigative reports;

2) A determination that the contamination on the subject property resulted from an off-site property source shall be made by KDHE;

3) KDHE determines that there is no source of contamination on the subject property, including soil contamination;

4) KDHE determines that the likely source of contamination exists nearby and its location may allow contamination to migrate onto the subject property;

5) The owner or operator, or both, of the subject property documents that the past and current use of the property could not have contributed to the contamination of soil, surface water, or ground water; and

6) The owner or operator, or both, of the subject property agrees to fully cooperate and allow reasonable access for the investigation and cleanup of the contamination from the source property.

When all of these requirements are met, KDHE can issue a "No Further Action" determination to the Class I Contamination property. If an off-site source property is found to be causing the contamination at the subject property and the source property is not being addressed under an agreement or order, the "No Further Action" determination can not be issued at that time; however, it could be issued in the future should an agreement or order be executed to address the source property.

Class II, Class III, and Class IV Contamination

If KDHE determines that previous environmental investigations at a property with Class II, Class III, or Class IV Contamination have not fully characterized the contamination, a Voluntary Cleanup Investigation (VCI) will be required to be performed at the property. The Scope of Work expected for the VCI Work Plan and VCI Report will be of increasing complexity and completeness for higher classes of contamination. KDHE's approval of the VCI Report will be based on the Voluntary Party's report satisfying the following objectives.

1) Source areas must be adequately characterized; i.e. type and nature of source(s) of contaminants, cause of release, estimated quantity of release(s), and whether the release(s) is/ are active or inactive.

2) The vertical and horizontal extent of contamination on or from the property must be characterized (including migration mechanisms).

3) Adequately characterize the chemical and physical properties of the contaminants, their mobility and persistence in the environment, and their important fate and transport mechanisms.

4) Identify any human or environmental targets that may be affected by the contamination.

5) Evaluate potential risk of contamination to human health and the environment.

VCI Tasks for Class II, Class III, and Class IV Contamination

This scope of work provides the specific guidance for completing a Voluntary Cleanup Investigation for each class of contamination by giving requirements for all classes or each class of contamination separately. If Voluntary Parties or their consultants have any questions about the appropriate Scope of Work for a property, they should contact KDHE for clarification before preparing the VCI Work Plan.

Task 1: Source Area(s) Characterization

All Classes: Define the vertical and horizontal extent and degree of contamination for all source areas. This task may include characterization to identify all source areas and/or eliminate suspected source areas.

Task 2: Extent of Contamination in Soil and/or Ground Water

All Classes: Define the vertical and horizontal extent of contamination in soil emanating from each source area identified. Determine background concentrations for targeted contaminants.

Class III, IV: Define the vertical and horizontal extent of contamination in ground water emanating from each source area identified. If free-phase product is present at the property, the horizontal and vertical extent of the product must also be determined. Determine background concentrations for targeted contaminants.

Class IV: If contamination extends beyond property boundaries, the vertical and horizontal extent of impact must be delineated. The other properties impacted must also be identified as to their use and ownership.

Task 3: Vadose Zone Physical Characteristics

All Classes: Define physical characteristics of the vadose zone. Note that this information may be necessary in evaluating contaminant fate and transport in soil and appropriate remedial technologies to address the contamination.

Task 4: Aquifer Characteristics

Class II: Not applicable.

Class III, IV: Determine the basic physical characteristics of the aquifer to ascertain contaminant fate and transport mechanisms, migration potential, and evaluate plausible remediation technologies and approaches.

Class IV: Conduct a site-specific hydrogeologic assessment to determine the physical properties of the aquifer including ground water flow direction, velocity, horizontal and vertical gradients and hydraulic conductivities, boundary conditions, storage characteristics, etc. This hydrogeologic information will be used to ascertain contaminant fate and transport mechanisms, migration potential, and evaluate plausible remediation technologies and approaches.

Task 5: Human or Environmental Targets/Risk

All Classes: Identify any human and/or environmental targets (receptors) that are or may be affected by the contamination. In conjunction with identification of receptors, evaluate the potential risk to human health and the environment posed by the contamination. The identification of receptors and evaluation of risk should consider all exposure pathways and exposure routes that are applicable. Provide specific information documenting the receptors identified such as locations of receptors, names and addresses, mechanism of potential exposure, etc.

Class IV: Inventory public and/or private water supply wells within one mile downgradient of the property, locate human populations (names and addresses), identify surface water bodies, and delineate any sensitive ecosystems, such as habitat for endangered species, that may have been or may be impacted by contamination from the property.

Task 6: Land Use Determination

All Classes: Determine the current and future land use on and surrounding the property. This information will be used to determine appropriate cleanup levels and remedial approaches.

Implementation of the VCI

The Voluntary Party can implement the VCI upon notification from KDHE that the VCI Work Plan has been approved. The KDHE Project Manager must be notified at least seven (7) days in advance of field work to provide KDHE an opportunity to be present to conduct general oversight and to collect split samples.

KDHE's initial contamination classification for a property is based on the best information available at the time. If additional information obtained while conducting the VCI indicates that the soil and/or ground water contamination at the property has migrated off-site, or that ground water contamination is not present and would not be expected to occur, **notify the KDHE Project Manager immediately!** KDHE will review the additional information with the Voluntary Party and determine if the contamination classification for the property should be adjusted at that time; adjustments in contamination classification can be made by the KDHE Project Manager only. If a contamination classification is adjusted to a lower classification, for example, Class II adjusted to Class I, less investigative work may be required. If the contamination classification is increased, for example, Class II to Class III, obtaining KDHE's adjustment of contamination classification while the investigation is on-going may eliminate duplicative reporting, allow the investigation to continue saving time and potentially costs, and generally expedite the VCI process.

VCI Report

The Voluntary Party must submit a VCI Report to KDHE for review, comment, and approval, to document the results of the investigation and provide other information about the site needed to make appropriate decisions regarding closure, monitoring or cleanup at the property. The VCI Report must be submitted to KDHE in accordance with the schedule included in the VCI Work Plan. Refer to the following discussion titled, "VCI Report Format," for the recommended VCI Report content and format.

VCI Miscellaneous Information

Phased Investigations. The VCPRP allows for phasing of VCIs in specific cases. Phasing investigations, especially for properties with little existing investigative information, can provide for a more efficient and cost effective approach. For example, a property in a setting with shallow groundwater and unconsolidated sediments would appear amenable to direct-push sampling for both soil and groundwater. Using field analytical methods, it may be possible to satisfy most investigative objectives in an initial mobilization, gathering the data necessary to establish an efficient monitoring well network in the event groundwater contamination is confirmed. There are many other scenarios where phasing an investigation makes sense and would likely be allowed. It would be appropriate to discuss potential options with the VCPRP project manager under this scenario.

If the VCI is proposed to be conducted in phases, KDHE will request that a comprehensive strategy be presented in the initial VCI work plan, outlining the scope of the initial phase in detail and identifying the objectives of the first phase and how results obtained will be used in subsequent phases, demonstrating the step-wise process toward satisfying VCI objectives. Details for subsequent phases may be more general in the initial proposal. Rather than preparing a comprehensive VCI report following each phase, a data submittal with proposals for work to be conducted in the subsequent phase will suffice. Additional work plans can be abbreviated and reference the initial work plan for procedural information, as appropriate. Keep in mind the intent of the VCPRP is to provide for a more expedient investigation process; **an unnecessary numbers of phases leading to prolonged investigation will not be allowed**.

Delineation of the Extent of Contamination. The Risk-based Standards for Kansas (RSK) Manual was developed through the VCPRP and ultimately adopted as, and modified to be, a Bureau-wide guidance for establishing site-specific human health risked based cleanup objectives. The experience of the VCPRP thus far is that RSK Tier 2 values listed in Appendix A are often confused with delineation objectives as opposed to cleanup objectives. In general, KDHE requires that the extent of contamination (in any media) be delineated to the lowest laboratory analytical detection limits possible so that it can be clearly demonstrated where the contamination is and isn't. The statement that contamination must be delineated to where it cannot be detected is a targeted objective, that is, an ideal goal that is not always achievable. As such, this does not mean in every case that numerous additional sampling locations are necessary to achieve this objective nor does it mean that for every project overseen by KDHE every contaminant plume is completely surrounded by non-detect sampling locations. KDHE's experience is that through standard investigative procedures, the extent of contamination is usually defined to a degree consistent with the targeted objective; in practice there may be little difference between the RSK level and non-detect. There are cases where additional sampling locations are considered necessary to satisfy the delineation objective. Professional judgement is applied by KDHE in deciding whether to require additional sampling for these circumstances, and includes considerations such as the ability to extrapolate a "zero edge" based on some control locations with no detectable contaminants, the existence of well defined concentration gradients, physical restrictions to or level of effort for installation of sampling points, potential receptors and exposure pathways in the immediate vicinity, etc. The bottom line is that, while an investigation should target complete delineation, it is not always possible. In those cases, KDHE can demonstrate flexibility when warranted and appropriately acceptable, based on site-specific circumstances. Note that such flexibility would only be provided in cases where reasonable attempts to achieve the targeted objective have been made.

KDHE requires complete delineation as opposed to delineating to RSK levels for the following reasons:

- RSK Tier 2 values listed in Appendix A are compound-specific and do not factor in the cumulative risk for multiple contaminants, if present. It is possible that an unacceptable risk occurs when there are multiple compounds present, with each compound being below its RSK level.

- The RSK guidance, as of the date of this publication, does not factor in potential exposures via indoor air (future RSK versions will include guidance for indoor air/ vapor intrusion considerations). Contaminants in soil or ground water can present unacceptable risk via indoor air pathways even at concentrations less than RSK values.

- RSK values are subject to change.

- The public has an expectation that KDHE will confirm the location of and distribution of contamination when identified. KDHE must be in a position to confidently state that we know where the contamination is and is not present.

- The real world is inherently more complex than we can sometimes appreciate; therefore, most environmental work constitutes an oversimplification of a more heterogeneous environment. Delineating to non-detect provides additional assurance that trends observed in limited data sets reflect genuine declines and not localized variations.

With regard to delineation objectives for naturally occurring contaminants, delineation to background concentrations is typically expected noting some additional sampling might be required to establish the background target concentrations for a given site setting.

Communication with VCPRP Coordinator and Project Managers. Candid and open communication with VCPRP staff cannot be overemphasized. The VCPRP strongly encourages voluntary parties to be directly involved, along with their consultants, in discussions concerning investigation strategies. VCPRP staff can facilitate a complete understanding of investigative objectives, share experiences in terms of successful investigative techniques, and identify investigative options that may not have been considered; regulatory guidance is sometimes revised providing new investigation options for a voluntary party that have not been previously considered.

VCI WORK PLAN AND REPORT FORMATS

VCI Work Plan Format

General: This guidance presents the recommended content and format for VCI Work Plans for environmental investigations at a property. **Please note that this guidance is comprehensive and does not segregate work plan content or format based on the varied contamination classification levels.** Many of the content items are common for all contamination classification levels; this guidance should be used and adapted as appropriate for the specific property and contamination classification being addressed. Please note also that the format guidance for the VCI Report requests some information from sources other than the VCI.

1.0 Introduction and Work Plan Rationale

1.1 VCI Objectives/Rationale - Provide a general overview of the objectives and rationale for conducting the VCI.

1.2 Data Needs and Objectives - Identify the types of data needed to achieve the VCI objectives. Provide discussion of the specific objectives for the various types of data by indicating how the data will allow VCI objectives to be achieved.

1.3 Work Plan Approach - Describe how the general work plan strategy has been developed and how proposed investigative activities will achieve the objectives of the VCI.

2.0 VCI Tasks

2.1 Proposed Field Investigation - Describe the proposed investigative activities relative to items 2.1.1 through 2.1.8 below. **Address only activities applicable to the contamination classification for the property as defined by the Scope of Work.**

2.1.1 Source Area(s) Characterization - Describe how the vertical and horizontal extent and degree of contamination for all source areas (soil, ground water, surface water, sediments, air, etc.) will be investigated.

2.1.2 Extent of Contamination in Soil - Describe how the vertical and horizontal extent of soil contamination emanating from each source area will be investigated.

2.1.3 Extent of Contamination in Ground Water - Define how the vertical and horizontal extent of ground water contamination emanating from each source area will be investigated.

2.1.4 Vadose Zone Physical Characteristics - Describe how physical characteristics of the vadose zone will be investigated.

2.1.5 Aquifer Characteristics - Describe the aquifer parameters that will be investigated during the VCI such as transmissivity, vertical and horizontal hydraulic conductivity, storativity, specific yield, boundary conditions, etc. Describe how the aquifer parameters are to be determined.

2.1.6 Investigative Derived Wastes - Describe how all investigative derived wastes are to be handled, treated, analyzed, and disposed of.

2.1.7 Regulatory Involvement - Describe all areas of the proposed investigation where local, state and/or federal regulatory authority will apply, such as well drilling, soil boring plugging, drilling permits, etc.

2.1.8 Permitting - Identify all state, local, or federal permits necessary for conducting the investigation.

2.2 Sampling Strategy - Describe the sampling strategy and objectives for the VCI; this discussion should be associated with items 2.2.1 through 2.2.4 below.

2.2.1 Sampling Objectives - Describe objectives of sampling efforts relative to the intended use of the data.

2.2.2 Sampling Locations and Frequency - This section should define what, when, where, and why samples will be collected. This would include samples for field screening and samples for laboratory analysis relative to all media being sampled.

2.2.3 Sampling Equipment and Procedures - Provide step-by-step instructions indicating how each sample will be collected. The instructions should also identify all equipment to be used for sample collection and decontamination procedures.

2.2.4 Sample Handling and Analysis - This should consist of a table that identifies sample preservation methods, types of sampling containers, shipping procedures and requirements, holding times, field screening analytical methods, and laboratory analytical methods.

2.3 Vadose Zone Contaminant Transport Modeling - If vadose zone modeling is proposed, identify the proposed model and the data necessary for input parameters. Describe in detail the nature of field testing that will be conducted to determine model input parameters. All modeling must be conducted in accordance with BER's policy "Minimum Standards for Model Use", BER-RS-007.

2.4 Ground Water Flow and Contaminant Transport Modeling - If ground water flow and contaminant transport modeling is proposed, describe in detail the proposed model(s) and the required model input parameters. Describe in detail any testing proposed to be conducted to determine model input parameters. All modeling must be conducted in accordance with BER's policy "Minimum Standards for Model Use", BER-RS-007.

2.5 Identify Potential Receptors - Inventory public and/or private water supply wells within one mile downgradient of the property, locate human populations (names and addresses), identify surface water bodies, and delineate any sensitive ecosystems, such as habitat for endangered species, that have been or may be impacted by contamination from the property.

2.6 Land Use Determination - Determine the current and future land use on and surrounding the property.

2.7 Other - Describe in detail other proposed investigative techniques.

3.0 Schedule

Provide a detailed schedule of proposed VCI activities which specifically identifies the dates and time frames for implementing and completing the VCI, including initiation of field work and submittal of VCI Report.

4.0 References

Provide a comprehensive listing of resources referenced in preparing the VCI Work Plan.

5.0 Tables

Provide tables of information and data as appropriate for quick reference within the VCI Work Plan. Tabulated data such as field screening data, laboratory analytical data, water level data, well completion data, etc., from previous investigations should be included.

6.0 Figures

At a minimum the following figures must be included within the VCI Work Plan (note - all figures must be to scale):

- A figure based on a USGS 7.5' topographic quadrangle map depicting the property location.
- A Site Map that depicts the entire property, clearly depicts property boundaries, and includes buildings and other pertinent features on the property and surrounding properties including potential source areas and potentially impacted receptors.
- A figure that depicts proposed sampling locations for the VCI.
- Any figures from previous investigation reports such as potentiometric maps or figures depicting known source areas and the known extent of contamination.

7.0 Appendix A - Quality Assurance Project Plan

A Quality Assurance Project Plan (QAPP) must be developed to describe the policy, organization, functional activities, and quality control and quality assurance protocols necessary to achieve the level of data quality required for its intended use. The QAPP must define the following information:

7.1 Key Personnel - Key personnel or organizations that are necessary for implementing each activity during the VCI, along with their responsibilities, must be identified.

7.2 Quality Assurance Objectives for Data - The degree of accuracy of sample analysis and how this degree of accuracy will be achieved must be identified. Also include within this section the numbers of, frequency and types of QA/QC samples such as trip blanks, field blanks, equipment blanks, and replicates to be collected.

7.3 Sample Custody - Describe how Chain of Custody will be maintained for samples collected for laboratory analysis.

7.4 Analytical Procedures - Indicate what specific laboratory methods will be used for analysis of samples.

7.5 Laboratory QA/QC - Describe the internal QA/QC program to which the laboratory conducting the analyses will adhere. Be sure to identify the laboratory that will be used.

7.6 Data Validation and Reporting - Describe how laboratory results will be validated to determine whether QA/QC protocol have been met. A summary of the data validation process including discussion of the results from analysis of replicates, laboratory or method blanks, matrix spikes and matrix spike duplicates, trip blanks, field blanks, equipment (rinsate) blanks, and other QA/QC samples will be required in the VCI Report. The VCI Work Plan should indicate how data validation will be conducted and that the results from data validation will be provided in the VCI Report.

8.0 Appendix B

A Site Health and Safety Plan consistent with OSHA requirements must be included with the VCI Work Plan.

VCI Report Format

General: This guidance presents the recommended content and format for VCI Reports. **Please note that this guidance is comprehensive and does not segregate work plan content or format based on the varied contamination classification levels**. Many of the content items are common for all contamination classification levels; this guidance should be used and adapted as appropriate for the specific property and contamination classification being addressed. Please note also that the report format requests information that may be found in sources other than the VCI, such as: property records, scientific publications, previous investigations, etc.

1.0 Executive Summary

Provide a preliminary summary of the VCI results.

2.0 Introduction

2.1 The introduction should provide a description of the specific objectives developed for the VCI prior to its initiation, include additional objectives established during the implementation of the VCI, and document whether the objectives were achieved or not achieved and why.

2.2 Property Background - *If this information was provided in a VCI Work Plan, reference it accordingly.*

2.2.1 Property Location and Demographics - Describe the property location; include legal description, street address, city, county, and general demographic information concerning the property area. Discuss population density, zoning, and predominant land usage in the vicinity of the property.

2.2.2 Property History - Provide a brief history of the property including operations, ownership, and past property activities until the time of application to the VCPRP.

2.2.3 Previous Investigations - Summarize results and conclusions from previous investigations conducted for the property (list the titles of all investigation reports that have been prepared). Also provide the dates of the current and previous investigations.

3.0 Investigative Activities

Describe in detail all investigative activities conducted as part of the VCI relative to the tasks outlined in the VCI Scope of Work for the property. Categories of information that may need to be specifically addressed (**as applicable to the property's contamination classification**) include:

a. Contaminant source areas
b. Impacted soil and ground water
c. Impacted surface water and sediments
d. Property geology and hydrogeology
e. Property soil and vadose zone characteristics
f. Property ground water/aquifer characteristics
g. Vadose zone transport, ground water flow, and ground water contamination transport modeling
h. Human/target population surveys
i. Area water well surveys
j. Ecological target surveys
k. Land use surveys

4.0 Property Physical Characteristics

Provide a detailed description of **results** obtained from investigative activities conducted during the VCI. Results should relate to each of the applicable categories listed in Section 3.0 above.

5.0 Nature and Extent of Contamination

Present the results of the characterization for the media investigated at the property. Describe in detail the horizontal and vertical extent of contamination identified for each medium characterized during the VCI. Provide reference to specific analytical results obtained during the VCI. Media that might be addressed during the VCI include:

a. Sources and source areas
b. Soils and vadose zone
c. Air
d. Ground water
e. Surface water and sediments

6.0 Contaminant Fate and Transport

6.1 Potential Migration Routes - Describe the potential routes of contaminant migration (i.e., air, soil, ground water, surface water, etc.).

6.2 Contaminant Characteristics - Describe the physical, chemical, and biological properties of contaminants at the property and provide specifics concerning behavior of these contaminants in the property setting.

6.3 Contaminant Migration

6.3.1 Discuss factors affecting contaminant migration for the media of importance (e.g., sorption onto soils, solubility in water, movement of ground water, etc.).

6.3.2 If modeling has been used, discuss modeling methods and results.

7.0 Identification of Potential Receptors and Land Use

7.1 Receptors - Identify any receptors which have been impacted or could potentially be impacted by the contamination. Receptors may include water supply wells, human populations, surface water bodies, sensitive ecosystems such as habitat for endangered species, etc.

7.2 Potential Risk - Describe the potential threat to impacted or potentially impacted receptors. Include discussion concerning the toxicity of the contaminant(s) as related to the threat or risk posed, how the receptor has been or may be exposed to the contaminant, and other detail to fully identify the risk posed by the contamination.

7.3 Land Use - Describe current and future land use of the property and surrounding properties.

8.0 Summary and Conclusions

8.1 Provide a summary of the VCI results addressing primarily:

8.1.1 Nature and extent of contamination

8.1.2 Contaminant fate and transport

8.1.3 Identified receptors/risk

8.2 Provide conclusions as derived from the VCI. Also address:

8.2.1 Data limitations

8.2.2 Recommendations for additional investigative work.

9.0 Tables

Certain data collected during the VCI must be presented in tables in the VCI Report. Tabulation of specific data must be done **as applicable for the work conducted during the VCI**. Required tables include, but are not limited to:

9.1 Soil Quality Field Screening - Provide field screening results for soil as derived from a soil gas survey, surface soil sampling, soil borings, and/or monitoring well borings. More than one table may be required to include the following types of information: 1) sample location identification and sample collection method; 2) date sample was collected and screened; 3) sample interval depth; and 4) results from field screening (concentration and units).

9.2 Soil Sample Laboratory Analytical Results - The table should include: 1) sample location identification and sample collection method; 2) date sample was collected; 3) sample depth; 4) target compounds; and 5) concentrations of compounds detected.

9.3 Ground Water Screening (Ground Water Survey) - Include the following information: 1) sample location identification and sample collection method; 2) date sample was collected and screened; 3) sample collection depth; and 4) compounds and concentrations (and units) detected during screening.

9.4 Well Completion Information - Include the following information: 1) well identification; 2) ground surface elevation; 3) top of casing/measuring point elevation; 4) screen length; 5) top and bottom of screen elevations; 6) total depth of well; 7) static water level elevation; and 8) date of static water level measurement.

9.5 Well Purging Data - Provide the following data collected during purging of wells for sampling: 1) date purged; 2) volumes purged; and 3) parameter measurement values (temperature, pH, conductivity, dissolved O_2, etc. - successive parameter measurements should demonstrate stabilization prior to sample collection).

9.6 Ground Water Analytical Results - Provide the following information: 1) well identification and sample collection method; 2) date sampled; 3) target compounds; 4) concentrations of contaminants detected; 5) analytical method and detection limits for each compound; and 6) appropriate data validation qualifiers.

9.7 Unsaturated and/or Saturated Zone Hydrogeological Testing Results - Tabulate the results from vadose zone and/or aquifer testing.

10.0 Figures

The following figures should be included in the VCI Report **as applicable to work conducted as part of the VCI**.

10.1 A figure based on a USGS 7.5' topographic quadrangle depicting the property location.

10.2 A Site Map, to scale, that depicts the entire property, property boundaries, buildings and other pertinent features on the property, surrounding properties, potential source areas, and potentially impacted receptors.

10.3 A sampling location map that depicts locations of monitoring wells, soil borings, soil gas and ground water survey probe locations, surface soil sampling locations, etc. It may be necessary to prepare separate maps for sampling locations to keep the map legible; e.g., separate maps for monitoring well locations versus ground water survey probe locations.

10.4 Potentiometric surface map - control points must be labeled and data such as static water level elevations at control points must be depicted on the map.

10.5 Geologic cross sections (as applicable) - at least two cross sections should be prepared that depict the geology of the property. The cross sections should be oriented longitudinally and transversely with respect to the orientation of soil and/or ground water contaminant plumes. The potentiometric surface should be depicted on the cross section.

10.6 Soil contamination extent maps - either isocontoured soil analytical data or general extent of soil contamination should be indicated.

10.7 Ground water contamination isoconcentration maps - these maps should depict the extent and degree of ground water contamination. It may be necessary to prepare an isocontour map for each contaminant, suite of contaminants, and total contamination.

10.8 Separate phase product isopach map - if separate phase product is encountered, a map depicting product extent and thickness must be provided.

11.0 Appendices

Appendices containing the following material, **as applicable to work conducted during the VCI**, must be included in the VCI Report. Appendices that contain other pertinent material should be developed and included as necessary.

11.1 Soil boring and monitoring well construction logs.

11.2 Soil gas or ground water survey analytical reports and QA/QC results.

11.3 Laboratory analytical reports for soil sample analysis.

11.4 Laboratory analytical reports for ground water analysis.

11.5 Data validation and usability summary.

11.6 Vadose zone or aquifer testing data and parameter estimation calculations.

11.7 Vadose zone or ground water flow modeling data and results.

11.8 Pertinent correspondence such as communications with regulatory agencies relative to permitting, waste characterization and disposal, etc.

11.9 Photographs - preferred by KDHE although not specifically required, photographs of property features, investigative activities, etc., are useful in providing additional documentation for the VCI report.